

The following is a summary of the functionally requirements document which has been presented on several occasions. “**complies**” indicates that the FPGA ROD architecture complies with the requirement.

1. ROB interface to ROL (S-LINK) (*not required for ROD99*)

- Must support flow control of ROL **complies**
- Must be able to output at 100KHz data rate preserving event order and chip and channel order within an event **complies**
- Must provide a diagnostic mode to test the ROL in situ **complies**

2. VME slave interface

- Must support **complies**
  - block transfer
  - programmed i/o
  - broadcast commands
  - interrupt generation
- Must provide storage for command sequences downloaded from VME **complies**
- Must provide memory for histograms and spy data (ROL mode) all data (VME mode) **complies**
- Must provide diagnostic memories **complies**
- Must provide access to error counters and error flags. **complies**
- Must allow read/write access to optocard registers. **complies**
- Must support interrupts to ROC in case of fatal ROD error. **complies**
- Must be able to disable or reset ROD from VME. **complies**

3. Handling received data

- Must support receipt of event data, calibration data, register data w/o flow control and w/o data loss (except in unusual circumstances, then this loss must be flagged) and be able to distinguish register data from event and cal data **complies**
- Not required to handle different data types at same time on different links, but should not get stuck if this happens; should flag the occurrence in output. **complies**
- Should work whether an SCT module is using both or only one of its links. **complies**

- Must be capable of merging the data streams. **complies**
- Must be configurable to mask and/or ignore any of the data streams. **complies**
- Timeout on a link must not hang the ROD. **complies**
- Error flags in input data must be recognized and flagged in output. **complies**
- Protocol errors in input data must be recognized and flagged in output. **complies**
- Must identify fatal errors (buffer overflow, loss of synchronization...), flag them and issue a VME interrupt if needed. **complies**
- Must count errors of any type and allow VME access to error counters. **complies**
- Must be able to disable error checking, except in preamble and trailer, from VME, i.e. support a raw data mode. **complies**
- No error on an input stream should cause the ROD to crash. **complies**

#### 4. specific to event and calibration data

- Must support **complies**
  - VME readout mode - 100KHz input, 1KHz output, 1% loss
  - ROL readout mode - 100KHz input, full ROL bandwidth, .1% loss
  - spy mode (VME sampling)
  - histogramming with no real time output
- Should not overwrite buffered data prior to readout **complies**
- Histogramming **complies**
  - SCT - number of hits vs. strip number
  - pixels - number of hits vs. pixel number
  - . - number of hits at a given TOT vs pixel number
  - Must keep track of the number of calibration events which were histogrammed.

#### 5. specific to register data

- Must be able to receive data on one stream when not all others are disabled.
- Must buffer for VME readout w/o loss. **complies**

#### 6. clock and control transmission

- Control signals received from the TTC must be received and in response properly formatted commands (MCC or ABC) must be transmitted to the modules via the optocard. **complies**

- Masking of optodriver data streams is performed on the optocard **complies**
- Must be able to operate with any one of three clock sources. They must be selectable via jumpers, program control or both. If they are selectable under program control they must default to BC clock on power-up. **complies**
  - BC clock from TTC
  - external 40 MHz clock received via front panel
  - internal 40 MHz clock
- All fast commands must be transmitted with the same fixed latency. **complies**
- Commands received from VME must be directed to specific modules according to addresses received from VME **complies**
- Commands received from TTC distribution will be masked on the optocard **complies**

#### 7. data flow control and synchronization

- Generate ROD\_Busy if data loss is at risk because ROD buffers are near full **complies**
- Must be able to disable the issuance of ROD\_Busy **complies**
- Must be able to read ROD\_Busy via VME
- Should check ROD\_BCID and ROD\_L1ID from TTC with those from links. Mismatches should be flagged in output stream and locally counted. A mechanism, which can be programmably enabled/disabled, to alert the local processor via an interrupt of mismatches should be provided. Default on power-up should be disabled. **complies**
- Provide data flow monitoring capabilities **complies**